and the variety of authorities quoted are extraordinary, and we welcome this addition to the literature of grasses as most opportune. The work is practical as well as theoretical. It deals with hay-making and ensilage, impurities and adulteration, preparation of the soil, time for sowing, quantities of seed, and judging the quality of seed. It also supplies accurate botanical descriptions, describes varieties, and treats of geographical distribution, growth, and development. So far as the list of plants described is concerned, the work is complete; so far as it purports to treat of the "best forage plants," it is incomplete, and ought either to have been preceded, or be followed, by another. As a botanical account of various members of the Gramineæ and Leguminosæ, the book is exceedingly useful. It must, however, be borne in mind that a large proportion of the grasses described are unimportant economically, and are therefore not to be ranked as among the best fodder crops. Take, for example Yorkshire fog (*Holcus lanatus*), false oat grass (*Arrhenatherum elateus*), yellow oat grass (*Avena flavescens*), sweet vernal grass (*Anthoxanthum oderatum*), reed canary grass (*Phalaris arundinaceæ*), upright brome grass (*Bromus erectus*), awnless brome grass (*Bromus inermis*), kidney vetch (*Anthillis vulneraria*), and goat's rue (*Galega officinalis*). These plants are not of any agricultural importance, and yet they occupy about one-third of the attention of the reader.

Dr. Stebler's book is, in fact, a study of pastoral plants rather than of agricultural crops, and its chief students will be found among seedsmen and those who are abandoning agriculture for the simpler processes of pastoral life.

As a manual of grasses it is exhaustive, so far as the plants selected for description are concerned, but the number described is limited, and the order in which they are introduced is curiously unscientific. Why, for instance, is sainfoin interpolated between *Festuca ovina* and *Festuca heterophylla?* and with what object is Alsike clover pitched in between rough-stalked meadow grass and sheep's fescue, and separated from red and white clovers by a number of true grasses?

Somewhat significantly, the first position in this standard work is allotted to perennial rye-grass, and in the light of the present controversy upon the value of this grass it is interesting to know what so high an authority as Dr. Stebler has to say upon its value and permanence. Speaking of it, he says:—"At times over-estimated, at times depreciated, it is yet one of the most valuable grasses. It is more a 'bottom' than a 'top' grass. For pastures on heavy soils it cannot be surpassed. In marshy districts where the soil is good, it forms a large proportion of the herbage, so much so that in such cases experienced agriculturists use only perennial rye-grass and a little white clover. Its duration depends very much on the nature of the soil and the climate: on dry, light soils it disappears after the second year, whilst in moist climates and on good heavy soils, it will persist for seven years or even longer." The word perennial must always be used in a qualified sense, as no grass, unless it be gifted with immortality, can actually be so described. The individuals perish, but their place is taken by fresh generations, and in is sense rye-grass may be considered as a lasting ingredient in pastures. Its occurrence on village greens, where it cannot seed, meadows, and town moors, as well as in almost all pastures, and especially those which are closely grazed, are evidences that rye-grass can hold its own for an indefinite length of time. Our own climate is especially suited to it, especially when the soil is of a heavy nature and of good quality. Dr. Stebler recommends 5 per cent. as the maximum amount in a mixture required for permanent pasture, but on this point we must differ from him. He, in fact, is not quite consistent, as he tells us that 80 per cent., with white clover to complete the mixture, is used for forming the excellent pastures on the alluvial flats of Northern Germany.

In the discussion now occupying the attention of agriculturists as to the value of perennial rye-grass, both sides may adduce arguments based on Dr. Stebler's opinion, but a perusal of the work will show that the relative permanence of the various grasses described is not pointed out with clearness. The subject is, indeed, beset with many difficulties, and the chief argument in favour of the true perennial character of rye-grass is its continual presence in closely-grazed pastures.

The illustrations of seeds and the botanical descriptions are among the most useful features of this excellent work. The analyses and chemistry of the grasses are also instructive. The book is evidently written from actual personal knowledge, and the positions of Dr. Stebler as Director of the Seed Control Station at Zürich, and of Dr. C. Schröter, the Professor of Botany, also at Zürich, are guarantees that the work is thorough and trustworthy.

Prof. McAlpine, who has undertaken the arduous work of translation, is the Botanist to the Highland and Agricultural Society. The work has been printed abroad, and the typography is somewhat cramped and the quality of the paper and binding scarcely worthy of the text. A glaring advertisement on the outside of the cover might well have appeared somewhere else than on a work of such standard merit as that of Drs. Stebler and Schröter.

JOHN WRIGHTSON.

THE ZOOLOGICAL RESULTS OF THE "CHALLENGER" EXPEDITION.

Report on the Scientific Results of the Voyage of H.M.S. "Challenger" during the Years 1873-76, *under the command of Captain George S. Nares, R.N., F.R.S., and the late Captain Frank T. Thomson, R.N.* Prepared under the superintendence of the late Sir C. Wyville Thomson, Knt., F.R.S., &c., Director of the Civilian Staff on board, and now of John Murray, LL.D., Ph.D., &c., one of the Naturalists of the Expedition. Zoology—Vol. XXIX. Published by Order of Her Majesty's Government. (London: Printed for Her Majesty's Stationery Office, and sold by Eyre and Spottiswoode, 1888.)

VOLUME XXIX. contains a Report, by the Rev. Thomas R. R. Stebbing, on the Amphipoda collected during the cruise of the *Challenger;* it forms one of the longest volumes yet issued, consisting of 1774 pages of letterpress, and is illustrated with an atlas of 212 plates.

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Of this immense volume, which will always remain a memorial of the patient research and labour of the author, just 640 pages are devoted to the bibliography. It is, perhaps, the most elaborate ever written as a preface to any form of a Report, and meeting one on the first opening of the pages, seems to challenge a few words of comment.

The importance of a bibliography to a student no one will refuse to acknowledge. A list of the works written on the subject of a Report not only shortens the references in the necessary quotations under the genera and species, but, when not required for this purpose, it helps to furnish material for further workers. Whether the list of works published should be arranged under the dates of publication or under the authors' names, alphabetically placed, has been a matter on which differences of treatment have occurred; in the present case they are arranged chronologically. The bibliography begins with the fourth century before Christ, when Aristotle wrote his "De Animalibus Historiæ," and is carried down to the present time, and is illustrated with woodcuts.

Under the date of publication, the author's name, and particulars of his birth and death, are given; these are followed by the full titles of his work, and then comes an analysis of the contents of the work, so far as these relate to Amphipod Crustacea. All of these analyses are of interest; all, or at least most, of them involved great skill and patience in their compilation; and many of them will be of service to future students. But still, it may very legitimately be doubted whether all this enormous mass of details as to the writings of the Milne Edwardses, Spence Bate, Boeck, &c., was necessary in a Report of the nature of the one before us, or whether it be in keeping with the regulations laid down for the guidance of those intrusted with the preparation of these Reports. In the printed suggestions made by the first Superintendent of these Reports, Sir Wyville Thomson, and, to the best of our belief, also approved of by Dr. Murray, was one "that no printing shall be unnecessarily repeated of matter which has already been printed elsewhere." This, it was added, does not apply to the preliminary Reports, leave to print which in various journals had been given.

If the important bibliographical list of Axel Boeck had been brought up to date, the student would have been benefited, and space would have been enormously saved; but the aim of the author seems rather to have been "to produce a record, after the annalistic method, of the progress of knowledge in this branch of natural history"—a very worthy aim, no doubt, and, as far as we can judge, well accomplished, but one outside a Report on the species taken during the *Challenger* cruise.

One hundred and eighty species are described as new, and thirty-one new genera are defined. The author feels sure that our knowledge of the group is still very imperfect, and calls attention to the fact that a few weeks' stay at Kerguelen yielded forty-eight species from this small region, previously supposed to be barren in Amphipods; and still none of the shore-frequenting species, mentioned by Dr. von Willemoes Suhm as "everywhere under stones," were apparently collected, so that still further additions to the Amphipod fauna may be expected.

As to the bathymetrical distribution of the Amphipods, there must be a good deal of uncertainty, as with other groups of animals taken in the trawls and tow-nets; some were undoubtedly taken at or near the bottom, while others were as certainly taken in the surface and subsurface waters: still, there seems some significance in the fact that, of twenty-eight species of the group of the Gammarina, said to be from depths of from 300 to 2300 fathoms, twenty-five genera are represented, of which ten are new, and twenty-six of the twenty-eight species are also new.

Many of the species described as new are as interesting as novel, but the details relating to them do not admit of being particularly referred to. In the introductory remarks, the author states that he believes the two well-known species of Gammarus, *G. pulex* and *G. locusta*, to be the representatives of an ancestral form of Amphipod.

"Far more than any other Amphipod, *Gammarus pulex* appears to have spread itself over the fresh-water streams of the world, and *Gammarus pulex* is connected by the very closest ties with *Gammarus locusta*. It is clear, from the general distribution of the Gammarina, that the chief nurseries whence they issue are the weeds of the coast. From these, the rivers are accessible, as well as the ocean; yet in the rivers the species of Amphipoda are few, while in the ocean they are multitudinous. This admits of a simple explanation, if we accept *Gammarus locusta* as representing the ancestral form which at one time occupied the world without the competition of other species of Amphipoda.

"In order to enable the family to extend its range over the fresh waters of the world, no further change was needed than such as would enable some of the progeny to pass from salt water to brackish, and from brackish to fresh. But, the section of this genus having once obtained command of the rivers, by the capacity of living vigorously in the river water, would have an immense advantage over all rivals attempting in the future to make a lodgment in the stream while their capacity for life therein was in its initial stages and only feebly developed."

There is an atlas of 212 plates, the figures on which have all been drawn by the author in a most satisfactory way. It is to be regretted that there are no detailed descriptions of these plates; perhaps with the 640 pages of bibliography, and sixty of index, this was too much to expect.

OUR BOOK SHELF.

Magnetism and Electricity. By Edward Aveling, D.Sc. (London: Chapman and Hall, 1889.)

As most intending candidates for London Matriculation will be aware, the new regulations affecting the science subjects have been in force since last June. Chemistry and natural philosophy have been replaced by mechanics, which is compulsory, and chemistry, light and heat, or magnetism and electricity, at the option of the student. To meet these new requirements Dr. Aveling has prepared a series of text-books on the specified subjects, of which the book before us is one. The book is of necessity planned on examination lines; and, although the author hopes "that the matter and method may be of service in the introduction of students generally to the subjects considered," we could hardly recommend it to those who do not require it for examination purposes. However, it completely covers the syllabus, and gives accurate, though often scanty, information. In the chapter on "Terrestrial Magnetism," for example, some very useful data are given,

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